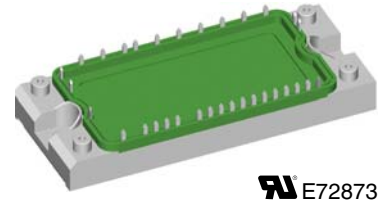
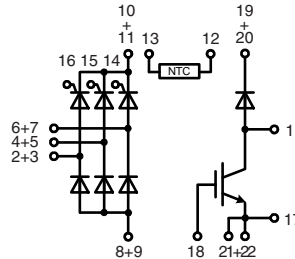


Three Phase Rectifier Bridge with IGBT and Fast Recovery Diode for Braking System

$V_{RRM} = 1600\text{ V}$
 $I_{dAVM} = 135\text{ A}$

V_{RRM}	Type
V	
1600	VVZB 135-16 NO1



See outline drawing for pin arrangement

Symbol	Conditions	Maximum Ratings		
V_{RRM}		1600	V	
I_{dAVM}	$T_C = 85^\circ\text{C}$; sinusoidal 120°	135	A	
I_{FSM}	$T_{VJ} = 45^\circ\text{C}$; $t = 10\text{ ms}$; $V_R = 0\text{ V}$	700	A	
	$T_{VJ} = 150^\circ\text{C}$; $t = 10\text{ ms}$; $V_R = 0\text{ V}$	610	A	
I^2t	$T_{VJ} = 45^\circ\text{C}$; $t = 10\text{ ms}$; $V_R = 0\text{ V}$	2450	A ² s	
	$T_{VJ} = 150^\circ\text{C}$; $t = 10\text{ ms}$; $V_R = 0\text{ V}$	1860	A ² s	
P_{tot}	$T_C = 25^\circ\text{C}$ per diode	190	W	
$(di/dt)_{cr}$	$T_{VJ} = T_{VJM}$; $f = 50\text{ Hz}$; $t_p = 200\text{ }\mu\text{s}$ repetitive; $I_T = 150\text{ A}$	100	A/ μs	
	$V_D = \frac{2}{3} V_{DRM}$; $I_G = 0.45\text{ A}$; $di_G/dt = 0.45\text{ A}/\mu\text{s}$ non repetitive; $I_T = I_{d(AV)}/3$	500	A/ μs	
$(dv/dt)_{cr}$	$T_{VJ} = T_{VJM}$; $V_{DR} = \frac{2}{3} V_{DRM}$; $R_{GK} = \infty$; method 1 (linear voltage rise)	1000	V/ μs	
P_{GM}	$T_{VJ} = T_{VJM}$; $t_p = 30\text{ }\mu\text{s}$	10	W	
	$I_T = I_{d(AV)}/3$; $t_p = 300\text{ }\mu\text{s}$	5	W	
P_{GAVM}		0.5	W	
V_{CES}	$T_{VJ} = 25^\circ\text{C}$ to 150°C	1200	V	
V_{GE}	Continuous	± 20	V	
I_{C25}	$T_C = 25^\circ\text{C}$; DC	95	A	
I_{C80}		$T_C = 80^\circ\text{C}$; DC	67	A
I_{CM}	$t_p = \text{Pulse width limited by } T_{VJM}$	100	A	
P_{tot}	$T_C = 25^\circ\text{C}$	380	W	
V_{RRM}	Fast Recovery Diode	1200	V	
I_{FAV}		$T_C = 80^\circ\text{C}$; rectangular $d = 0.5$	27	A
I_{FRMS}		$T_C = 80^\circ\text{C}$; rectangular $d = 0.5$	38	A
I_{FRM}		$T_C = 80^\circ\text{C}$; $t_p = 10\text{ }\mu\text{s}$; $f = 5\text{ kHz}$	tbd	A
I_{FSM}	$T_{VJ} = 45^\circ\text{C}$; $t = 10\text{ ms}$	200	A	
P_{tot}	$T_C = 25^\circ\text{C}$	130	W	

Features

- Soldering connections for PCB mounting
- Convenient package outline
- Thermistor
- Isolation voltage 2500 V~

Applications

- Drive Inverters with brake system

Advantages

- 2 functions in one package
- Easy to mount with two screws
- Suitable for wave soldering
- High temperature and power cycling capability

Recommended replacement:

VVZB 135-16ioXT

Data according to IEC 60747

IXYS reserves the right to change limits, test conditions and dimensions.

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Symbol	Conditions	Characteristic Values ($T_{VJ} = 25^{\circ}\text{C}$, unless otherwise specified)		
		min.	typ.	max.
I_{R}, I_D	$V_R = V_{RRM}; T_{VJ} = 25^{\circ}\text{C}$			0.1 mA
	$V_R = V_{RRM}; T_{VJ} = 150^{\circ}\text{C}$			20 mA
V_F, V_T	$I_F = 80 \text{ A}; T_{VJ} = 25^{\circ}\text{C}$			1.43 V
V_{T0}	for power-loss calculations only			0.85 V
r_T	$T_{VJ} = 150^{\circ}\text{C}$			7.1 m Ω
V_{GT}	$V_D = 6 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$			1.5 V
I_{GT}	$T_{VJ} = -40^{\circ}\text{C}$			1.6 V
	$V_D = 6 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$			78 mA
I_{GD}	$T_{VJ} = -40^{\circ}\text{C}$			200 mA
	$T_{VJ} = T_{VJM}; V_D = \frac{2}{3} V_{DRM}$			0.2 V
I_{GD}	$T_{VJ} = T_{VJM}; V_D = \frac{2}{3} V_{DRM}$			5 mA
I_L	$V_D = 6 \text{ V}; t_G = 10 \mu\text{s};$ $di_G/dt = 0.45 \text{ A}/\mu\text{s}; I_G = 0.45 \text{ A}$			450 mA
I_H	$T_{VJ} = T_{VJM}; V_D = 6 \text{ V}; R_{GK} = \infty$			100 mA
t_{gd}	$V_D = \frac{1}{2} V_{DRM};$ $di_G/dt = 0.45 \text{ A}/\mu\text{s}; I_G = 0.45 \text{ A}$			2 μs
t_q	$T_{VJ} = T_{VJM}; V_R = 100 \text{ V};$ $V_D = \frac{2}{3} V_{DRM}; t_p = 200 \mu\text{s};$ $dv/dt = 15 \text{ V}/\mu\text{s}; I_T = 20 \text{ A};$ $-di/dt = 10 \text{ A}/\mu\text{s}$			150 μs
R_{thJC}	per diode			0.65 K/W
R_{thCH}			0.2	K/W
$V_{BR(CES)}$	$V_{GS} = 0 \text{ V}; I_C = 0.1 \text{ mA}$	1200		V
$V_{GE(th)}$	$I_C = 8 \text{ mA}$	4.5		6.45 V
I_{CES}	$V_{CE} = 1200 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$			0.1 mA
	$V_{CE} = 0.8 \cdot V_{CES}; T_{VJ} = 125^{\circ}\text{C}$			0.5 mA
V_{CEsat}	$V_{GE} = 15 \text{ V}; I_C = 100 \text{ A}$			3.5 V
$t_{SC}(\text{SCSOA})$	$V_{GE} = 15 \text{ V}; V_{CE} = 900 \text{ V}; T_{VJ} = 125^{\circ}\text{C}$			10 μs
RBSOA	$V_{GE} = 15 \text{ V}; V_{CE} = 1200 \text{ V}; T_{VJ} = 125^{\circ}\text{C};$ clamped inductive load; $L = 100 \mu\text{H};$ $R_G = 22 \Omega$			100 A
C_{ies}	$V_{CE} = 25 \text{ V}; f = 1 \text{ MHz}; V_{GE} = 0 \text{ V}$		3.8	nF
$t_{d(on)}$	$V_{CE} = 720 \text{ V}; I_C = 50 \text{ A}$ $V_{GE} = 15 \text{ V}; R_G = 22 \Omega$ Inductive load; $L = 100 \mu\text{H};$ $T_{VJ} = 125^{\circ}\text{C}$		150	ns
$t_{d(off)}$			680	ns
E_{on}			6	mJ
E_{off}			5	mJ
R_{thJC}				0.33
R_{thCH}			0.1	K/W

Symbol	Conditions	Characteristic Values ($T_{VJ} = 25^{\circ}\text{C}$, unless otherwise specified)		
		min.	typ.	max.
I_R	$V_R = V_{RRM}; T_{VJ} = 25^{\circ}\text{C}$ $V_R = 1200\text{ V}; T_{VJ} = 125^{\circ}\text{C}$		1	0.25 mA mA
V_F	$I_F = 30\text{ A}; T_{VJ} = 25^{\circ}\text{C}$			2.76 V
V_{T0}	For power-loss calculations only			1.3 V
r_T	$T_{VJ} = 150^{\circ}\text{C}$			16 m Ω
I_{RM}	$I_F = 50\text{ A}; -di_F/dt = 100\text{ A}/\mu\text{s}; V_R = 100\text{ V}$		5.5	11 A
t_{rr}	$I_F = 1\text{ A}; -di_F/dt = 200\text{ A}/\mu\text{s}; V_R = 30\text{ V}$		40	ns
R_{thJC}				0.9 K/W
R_{thCH}			0.25	K/W
R_{25} $B_{25/50}$	NTC $R(T) = R_{25} \cdot e^{B_{25/100} \left(\frac{1}{T} - \frac{1}{298K} \right)}$	4.75	5.0 3375	5.25 k Ω K

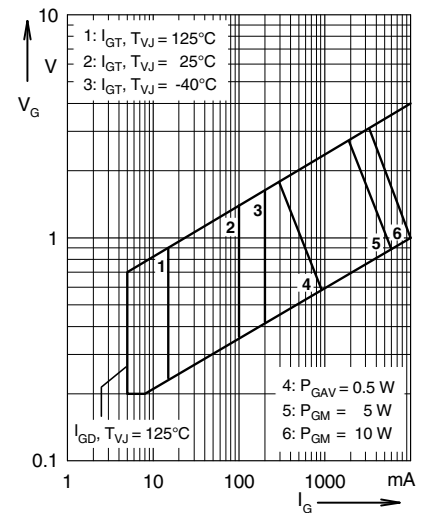


Fig. 1 Gate trigger characteristics

Symbol	Conditions	Maximum Ratings	
T_{VJ}		-40...+150	$^{\circ}\text{C}$
T_{VJM}		150	$^{\circ}\text{C}$
T_{stg}		-40...+125	$^{\circ}\text{C}$
V_{ISOL}	50/60 Hz; $t = 1\text{ min}$ $I_{ISOL} \leq 1\text{ mA}; t = 1\text{ s}$	2500 3000	V~ V~
M_d	Mounting torque	2.7...3.3	Nm
d_s	Creep distance on surface	12.7	mm
d_A	Strike distance in air	9.6	mm
a	Maximum allowable acceleration	50	m/s^2
Weight	typ.	180	g

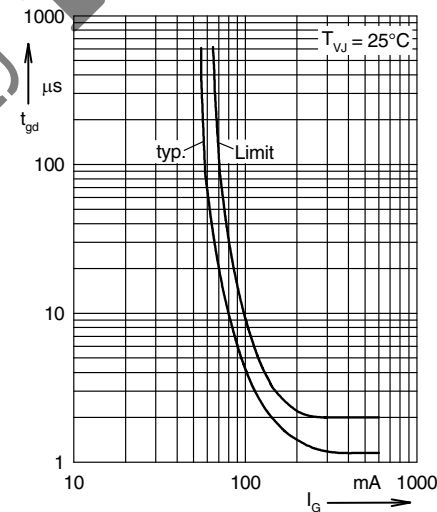
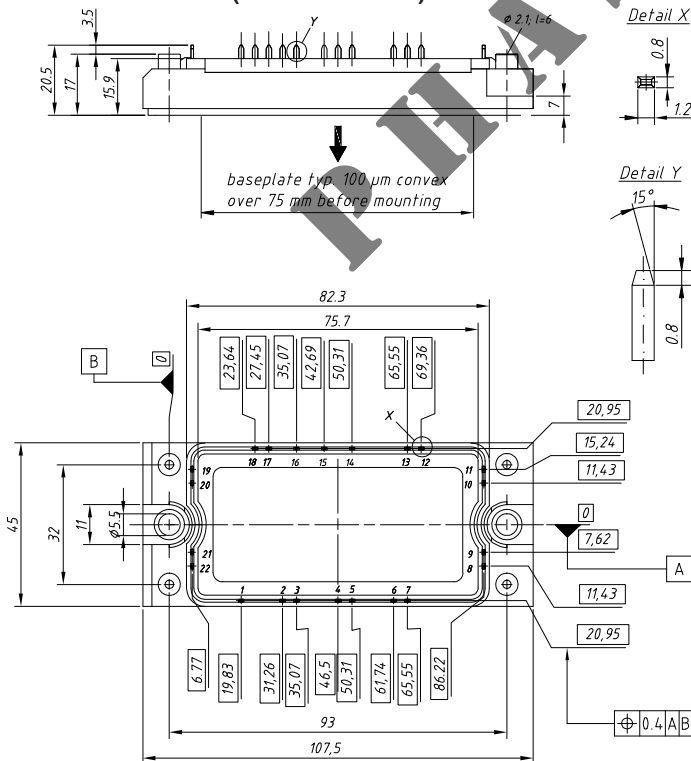


Fig. 2 Gate trigger delay time

Dimensions in mm (1 mm = 0.0394")



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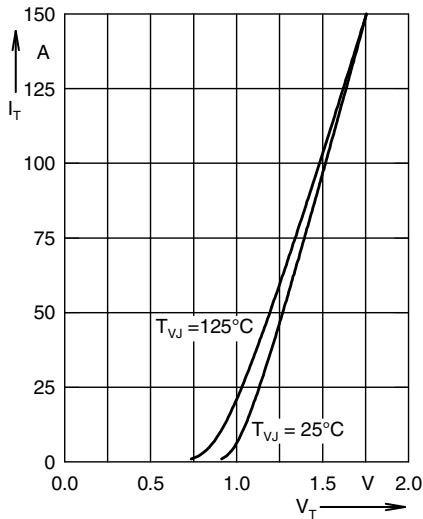


Fig. 3 Forward current versus voltage drop per leg

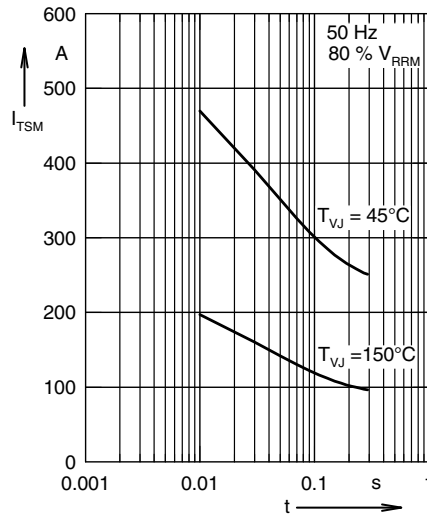


Fig. 4 Surge overload current

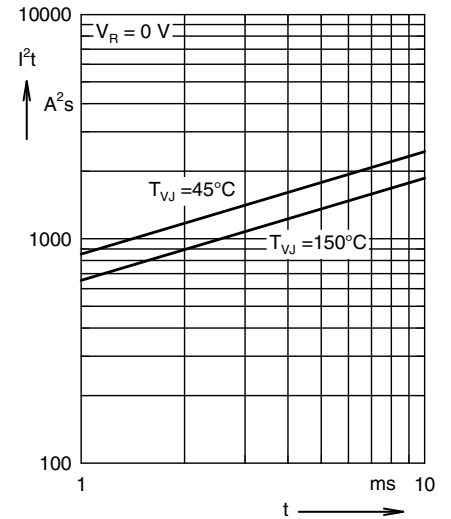


Fig. 5 I^2t versus time (per thyristor/diode)

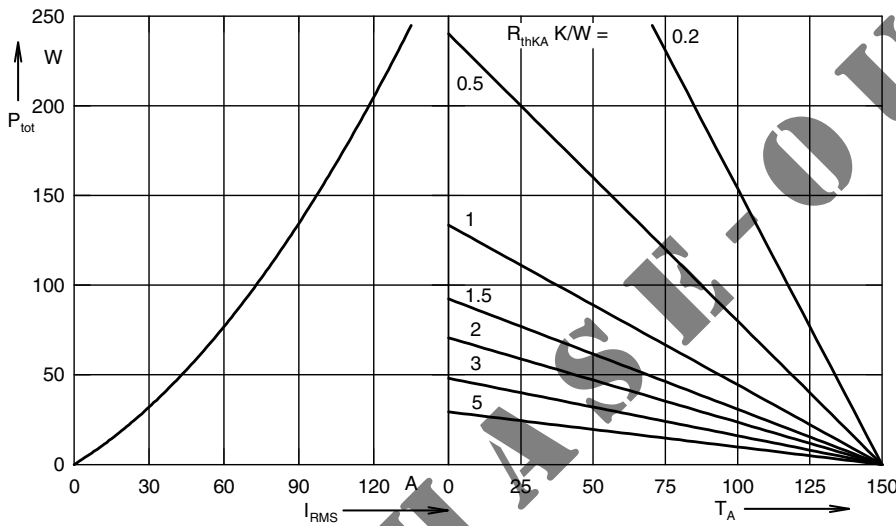


Fig. 6 Power dissipation versus direct output current and ambient temperature

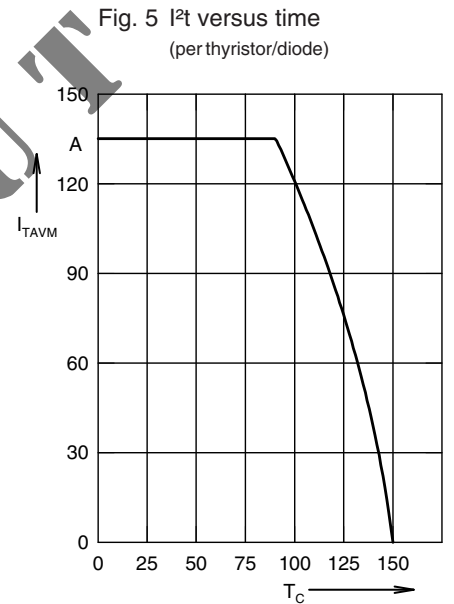


Fig. 7 Maximum forward current at case temperature

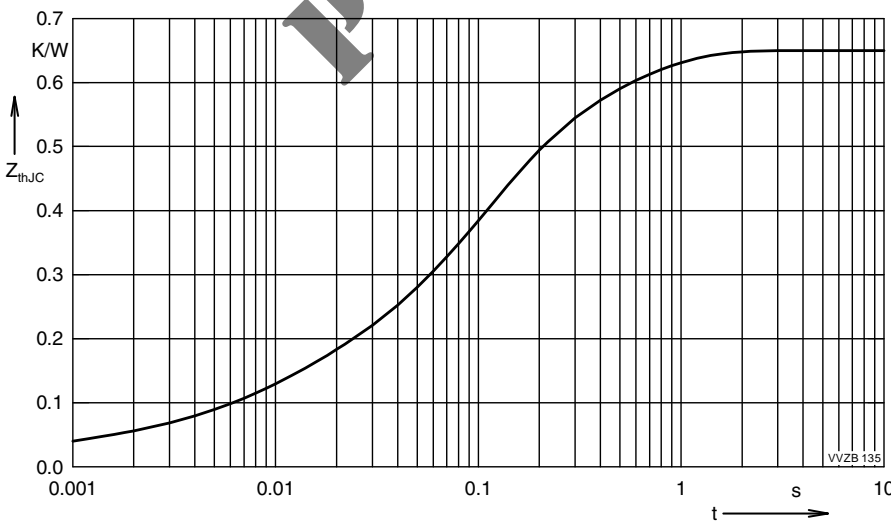


Fig. 8 Transient thermal impedance junction to case (per thyristor/diode)

Constants for Z_{thJC} calculation:	
R_{thi} / (K/W)	t_i / (s)
0.03	0.0005
0.083	0.008
0.361	0.094
0.176	0.45

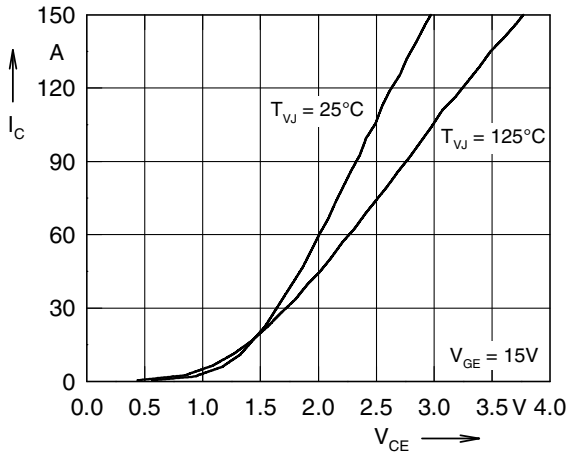


Fig. 9 Typ. output characteristics

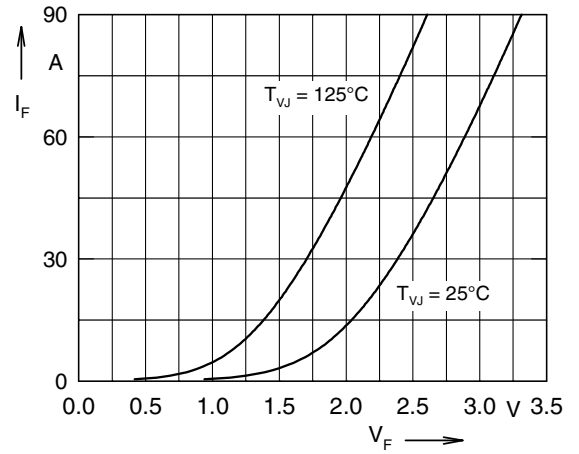


Fig. 10 Typ. forward characteristics of free wheeling diode

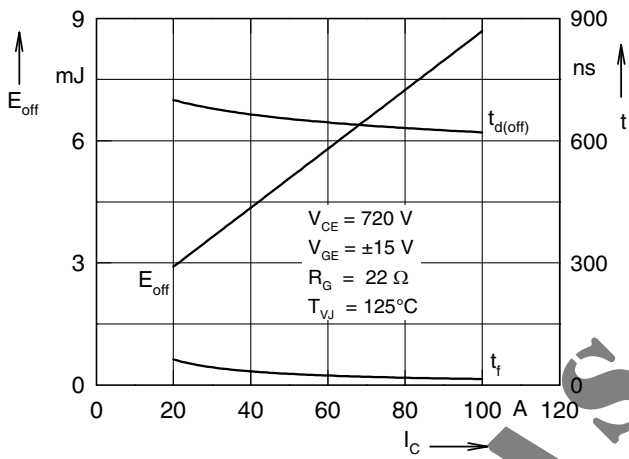


Fig. 11 Typ. turn off energy and switching times versus collector current

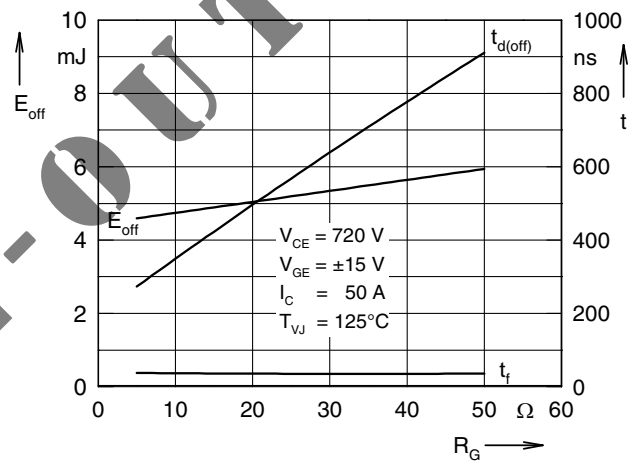


Fig. 12 Typ. turn off energy and switching times versus gate resistor

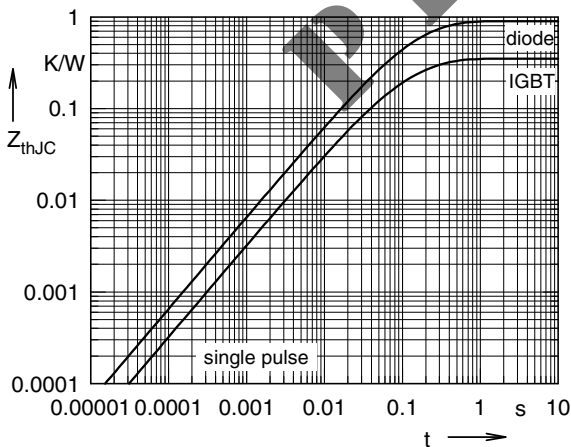


Fig. 13 Typ. transient thermal impedance

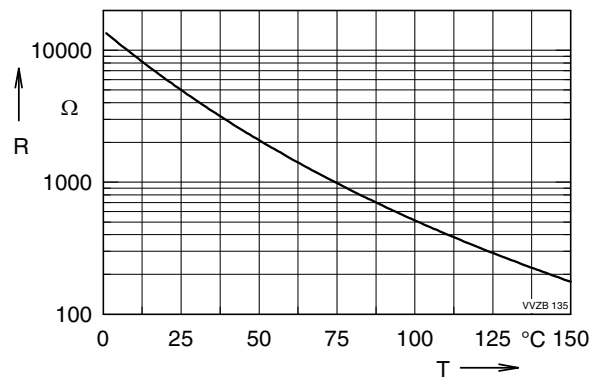


Fig. 14 Typ. thermistor resistance versus temperature